

# Sustainable agriculture

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# Sustainable Agriculture Definition

- The ability to maintain production over long time frames despite major ecological and socio-economic perturbations and stress

(Conway 1985; Altieri 1987)

# Sustainable Agriculture Definition

- Is not the fixed state of harmony, but rather a process of change in which the exploitation of resources, direction of investments, the orientation of technological developments, and the institutional changes are made consistent with the future as well as present needs

(Brundland 1987)

# Elements of a sustainable food system

## ■ Physiological factors:

- soils,
- climate,
- moisture,
- radiation,
- day length

# Elements of a sustainable food system

## ■ Biological elements:

- Crops,
- Animals
- Pests

# Elements of a sustainable food system

- **Changing and appropriate technologies to the farmers**
  - **Sociocultural background:**
    - education,
    - policy,
    - experience.

# Elements of a sustainable food system

## ■ Economic viability:

- market
- costs
- management

## ■ Ecological soundness:

- preservation of biodiversity and ecosystem functions

# Dimensions of a sustainable food system

- **Economic**
- **Social - Cultural**
- **Ethical**
- **Agronomic**
- **Ecological**



# Integrations in a sustainable food system

- Environment
- Society
  - economy
- Ecology

# Foundations of Sustainable Agriculture

- The structure and function of local ecosystems is mimicked as closely as possible.
- Adaptable landscapes:
  - long-term sustainability of land use is nested within adaptable landscapes.
  - native, natural ecosystems are necessary for sustainable land use.
- Production is scaled to local renewable resources and natural pulses.
- Context specific, place-based management.
- Biophysical limits of production are accepted.

# Foundations of Sustainable Agriculture

- Productivity is channelled into outputs of nutritional and economic importance.
- Economic values should reflect ecological realities.
- Indirect ecosystem services are recognized and supported.
- Production and efficiency definitions include all contributory aspects of living systems.

# Foundations of Sustainable Agriculture

- Biodiversity is maintained for being able to compensate for losses while still keeping the system simple enough to manage.
- Diversity contributes to buffering capacities.
- The management of plants and animals facilitates associational resilience.
- Use perennial plants whenever possible to maintain soil fertility.

# Foundations of Sustainable Agriculture

- The non renewable energy sources are not used for maintaining growth rate but for investments, storages.
- The focus is on processes.

# Foundations of Sustainable Agriculture

- **There is not concentration of compounds and by-products that are harmful to ecosystem.**
- **Management for wholes not parts.**
  - **Ecosystem services and individual production targets are nested within diverse and tightly coupled networks.**

# Foundations of Sustainable Agriculture

- Performance is monitored and actions are adjusted according to changing conditions
  - adaptive holistic management.
- Assessment and management tools require scientific foundations firmly placed within ecological and biophysical realities.
- Plans, goals allow for chance events, uncertainty and risks (flexibility).

# Foundations of Sustainable Agriculture

- **Socially just, equitable, humane.**
- **Local and on-farm labour**
  - **Community involvement promotes local knowledge and empowerment.**



# Foundations of Sustainable Agriculture

- **Foundations for renewal that build and sustain:**
    - the capacity of people,
    - economies
    - and nature
- for adapting to context and change are encouraged.**

# Sustainable food system

- Interrelates all parts of a farming system, including the farmer and his family
- Biological balances in the system are important
- Need to maximise desired biological relationships in the system and to minimize use of material and practices that distrust those relationships

# *Local production and sustainable production*

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# Traditional/local agroecosystems

- Represent an intermediate point between natural ecosystems and conventional agriculture.
- They have advantages and disadvantages as actual production systems

# Characteristics of traditional production systems

- low inputs
- cultivation techniques based on agroecosystem processes and properties
- naturalistic knowledge system

# Characteristics of traditional production systems

- low inputs
  - energy
  - water
  - other inputs

# Characteristics of traditional production systems

- agroecosystem based cultivation techniques
  - utilising marginal areas
  - appropriate and necessary cultivation practices
  - use of under-cropping
  - construction of terraces
  - mixed farming systems

# Characteristics of traditional production systems

- **naturalistic knowledge system**
  - low demands life style
  - use of farmers' knowledge and participation
  - learning processes based on nature's processes



# Traditional / local agroecosystems

- Do not depend on commercial inputs
- Use renewable and locally available resources
- Emphasize the recycling of nutrients
- Benefit the environment both off and on the farm.
- Adapted to local conditions
- Make maximum use of microclimates
- Maximize yields while also maintaining productive capacity.
- Maintain spacial and temporal diversity and continuity.
- Prioritize production to satisfy local needs.
- Depend on and conserve local genetic diversity.
- Depend on and conserve local knowledge and culture

# Reasons for breaking sustainability traditional production systems

- population pressures
- change in rural population's values
- opening of the markets

# Farming and low input or organic farming

- Centuries old tradition of farming
- Often difficult to distinguish organic farming from
  - Traditional
  - Extensive
  - Low chemical input agriculturedue to lack of or insufficient applied regulations